GoldenGate
High Availability and Disaster Recovery
Modern Considerations and Options
NYOUG Meeting – June 6, 2006
Agenda

- Introduction
- High Availability - 2006
- Industry Shift from MTTF to MTTR, Continuous Availability
- Challenges in HA environments
- Understanding/Evaluating HA technologies
- TDM HA Solutions
- Questions & Answers
Speaker Introduction/Background

- Chris Lawless
  - Open Systems Technical Lead, GoldenGate Software
  - Software Analyst for GoldenGate's Technical Services team
  - Top instructor in helping users implement high availability and real-time data integration solutions for a variety of databases running on Windows and UNIX platforms

- Senior Database Instructor for Oracle Corporation
  - 2003 Oracle's DBA West "Instructor of the Year" award
  - Oracle's "Gold Club" award by consistently achieving customer satisfaction ratings exceeding 95.5%
HA (2006)

- **Definition**
  - Ratio of system uptime to sum of uptime and downtime
  - Availability = MTTF/(MTTF+MTTR)

- **Challenges**
  - Addressing Performance vs. Reliability in computer systems
  - Hardware Faults, Software Bugs, Human errors are realities in any complex system deployment
  - Enterprise applications need to function 24x7
  - Disasters are no longer a distant threat
  - Inadequate planning to handle outages
The 3 States of Availability: Systematic View

#1: Active
Throughput/Latency

#2: Planned Outage
- Migrations
- Upgrades
- Maintenance

#3: Unplanned Outage
- System Failure
- Data Failure
High Availability Concerns (No Outage)

#1: Active

- Latency
- DSS vs. OLTP conflicting requirements
- Mixed workload
- Data validation
- Data transformation

Common Approaches

Add more…

- Nodes
- Resources
- Infrastructure
High Availability Concerns (Planned Outages)

#2: Planned Outage

- Migrations
- Upgrades
- Maintenance

Common Approaches

- Selected windows of downtime
- Phased approach to maintenance
High Availability Concerns (Unplanned Outages)

Common Approaches

- Database Restore/Recovery
- RAID
- Shared Disk Clusters
- Standby database

#3: Unplanned Outage

- System Failure
- Data Failure
Evaluating HA Technologies

- Availability
  - Is the Failover/DR solution available for real use?
- MTTR (RTO)
  - In the event of a failure, how soon can the data be recovered?
- Performance
  - Speed and support for high volumes
- Data Loss (RPO)
  - What is the impact of an unplanned outage in terms of lost data?
- Zero downtime
  - Does the solution allow for zero downtime during planned outages?
- Manageability
  - Configuration, Install, Monitoring
- Impact on deployed systems
  - How intrusive? What is the impact on data itself?
- Cost
  - Licensing, maintenance
Differentiating HA Technologies

- Conventional Backup/Recovery
- RAID
  - multiple hard disks behaving as a single large fast drive (mirrors/stripes/duplexing/parity)
- Snapshots

- Block Level Database Replication
- Change Level Database Replication
- Remote Mirroring Solutions
- Transactional Data Management

Roll Forward / File Protection

High Availability and Disaster Recovery
HA Technologies & Tradeoffs

**Block based database replication**
- Standby kept in constant recovery (mount) mode
  - Useful for strict disaster recovery only, not HA
  - Cannot be used for reporting in recovery mode
  - No write access for distributed load balancing
  - Application response times suffer after failover
  - Cannot address availability across heterogeneous systems

**Change based database replication**
- Trigger or log based
  - Not optimized for real time performance
  - Intrusive, Complex
  - Cannot address availability across heterogeneous systems
Remote mirroring solutions

Volume managers maintain mirrors of local writes on a set of remote volumes
- Useful for file protection
- Physical distance to remote volumes is a critical limitation
- No protection from logical corruption, or storage stack corruption

Message based logical writes sent by primary host over IP to remote hosts (synchronously/asynchronously)
- Write ordering must be maintained by primary host
- Remote volumes are standby-only, applications cannot access them
- No protection from logical corruption

Hardware based
- Storage arrays propagate IOs to storage arrays at a secondary site
- Secondary arrays are inaccessible during replication
- No protection from logical corruption
- Only useful for block availability during DR
Oracle: Technologies & Tradeoffs

- **RAC**
  - Good for protection from system failures
  - Shared disk architecture can result in single point-of-failure
  - Complex deployment, no protection from media failure

- **Data Guard**
  - **Physical standby**
    - Runs in inactive mode (mounted)
    - Cold cache increases MTTR from transactional standpoint
    - Network latency (over SQL*Net)
    - Media recovery process lags significantly during heavy workloads
  - **Logical standby**
    - Redo/Archive logs shipped over the network to standby site
    - Real time reporting, High throughput workloads (9i limited support)
    - Vulnerable to data loss (9i)
    - RTA – Performance impact on LGWR
    - Read Only access for data set being logically protected
Oracle: Technologies & Tradeoffs

- **Streams**
  - Good for information sharing in low to moderate throughput environments
  - Allows Oracle databases to be on different platforms
  - Limited support for datatypes in pre 10g release
  - Metadata managed within database
  - Requires custom application for capture from non-Oracle database
**Transactional Data Management**

- Captures, transforms, routes, and delivers data transactions in real time across heterogeneous environments
  - Data integrity, low impact/overhead, high volume
  - Many use cases for HA, DR, data integration, live reporting, data warehousing, distributed computing
  - Not for file-level replication
HA/DR: Solution Examples

#1: Active

Throughput/Latency

#2: Planned Outage

Migrations

Upgrades

Maintenance

#3: Unplanned Outage

System Failure

Data Failure
HA Configuration: Multi-Master

• Bi-directional configuration – dual-master for load balancing, improved performance and throughput

• For…
  • Highest Availability
  • Maximized ROI on hardware (transaction balancing)

• Example areas:
  • 24x7 (ATMs, Online Banking)
  • Online Retail
HA Configuration: Scalability

- Improve scalability and performance of transaction processing by offloading query load to lower-cost databases/platforms

- For...
  - Horizontal scalability
  - Improved performance

- Example areas:
  - Online Reservations
  - Online Lookups
HA Configuration: Disaster Tolerance

- An HA implementation that captures and applies data to a failover system in real time.

- For...
  - Fast failover (No restore)
  - Do root-cause analysis later!
  - Surgical Repair (Dynamic, Selective undo)

- Example areas:
  - 24x7/mission-critical applications
  - Strict SLA requirements
HA Configuration: Switchover

- Zero-Downtime Migrations
- Rolling Upgrades
- Zero-Downtime Maintenance
- Failback contingencies

For...
- 24x7 availability
- Reduced windows for system maintenance

Example areas:
- Can’t afford downtime to do in-place upgrade
About GoldenGate Software

GoldenGate Software is a privately held software company that offers **Transactional Data Management** solutions.

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<th>Established, Loyal Customer Base</th>
<th>250 customers... 1500+ solutions implemented... in 35 countries</th>
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<tr>
<th>Leading Industry Solutions</th>
<th>18,000 Node ATM Network with 24/7 Availability</th>
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<tr>
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<td>Achieving paperless enterprise for this visionary healthcare provider</td>
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<td>Saving $ millions with real-time DW and zero downtime migrations.</td>
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<td>Database tiering handles average of 300,000 updates/hour, peaks at 800,000/hour</td>
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Thank You.  Q&A

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